

Tyler Borysiak
ECE 480
Team 9 Manager

Professional Self-Assessment Report

The ECE 480 Senior Capstone design course has helped me to understand the importance of effective team-based design and collaboration. As team manager, I have learned the importance of effective communication, time management, organization, cost management, and cohesiveness. Throughout the semester, our team has been challenged to solve complex problems in a timely manner. From these design challenges, I have learned how to effectively manage a small group of electrical and computer engineers in order to design a robust and rugged E-Bike motor and controller.

1. How have I satisfied the learning objectives in this course and contributed to team and course outcomes? Cite each learning objective and refer to examples throughout the term. The course learning objectives were listed on the course syllabus distributed the first week of class (see the course web site).

I helped prepare and construct our design proposal and presentation in numerous ways. As the team manager, I coordinated meetings with our facilitator Professor Virginia Ayres and our sponsor Stephen Blosser from RCPD in order to fully understand the design specifications and what needs to be done in order to provide a low-cost product. I also personally researched automotive alternators and their various applications in order to understand how an automotive alternator could be used to act as a low-cost DC motor.

I was involved in all of the day-to-day design activities and the management of the project in many ways. As team manager, I was in charge of setting up all team

meetings, including meetings with our sponsor to review progress and discuss next steps, meetings with our facilitator to discuss our design progress and current technical issues, and team meetings that were either technical meetings to work on our software and hardware design or meetings that involved working on class deliverables. I was also in charge of managing the team's project schedule in a Gantt chart format. I constructed this Gantt chart and made sure that our team was on track throughout the semester with the project deliverables and requirements. Another task that I managed was the budget and the cost of the total project. I constructed and updated a spreadsheet of the budget and the cost of all materials used. I separated the cost of the project into two categories: cost of all parts used in the design process and cost of one project prototype design. Not only was I in charge of managing the project as a whole, I was also the hardware technical lead. Our team was separated into two main sub-groups: a hardware group and a software group. As a member of the hardware group, I designed the schematic for our prototype on EAGLE software and transferred this schematic onto a PCB which was then fabricated. After the board was fabricated, I participated in the soldering of the components onto the PCB. Throughout the design meetings, I also troubleshooted the hardware design and made sure that the hardware was working correctly with the software.

As the manager, I was in charge of scheduling and coordinating the meetings that went over presentations and written reports. In the proposal presentation and technical presentation, I was the main organizer and made sure that the timing of each team member was correct. During the presentations, I introduced our team and described the team's main goals and the agenda. I also went over the team's budget and cost projections as well as the high-level design specifications. In the technical presentation, I introduced the team and the agenda and talked about the different parts of a wye-connected automotive alternator and described the high-level functionality of each part. In the final proposal, I was responsible for working on the motivation, summary of benefits, budget, and project management sections.

During the initial demo and the prototype demo, I was in charge of making sure a working product was ready to be demonstrated as well as making sure that the demonstration was organized in an effective way. During the presentation, I initiated the demos and talked about the hardware aspects of the project.

Throughout the semester, I documented each hardware design adjustment that was made and also documented any results that were recorded from lab testing. This was a very important task because it helped our team understand what changes needed to be made and what design adjustments proved to be successful.

I gained a lot of experience with technical documentation throughout the semester by helping to write all of the technical documents such as the proposal and the application note that I wrote on designing a schematic in EAGLE.

Another area that I contributed in was in the safety of the design. I researched and ordered terminal blocks for the connections between the stator coils and the PCB, and also researched and ordered the circuit breakers used for over-current protection at the negative terminal of the battery.

2. What have I learned about the design process from my work on the design project. Restate your portion of the overall project as defined in your team's design proposal, which was developed and completed in week 6 of the semester. Describe your work during the semester on your TECHNICAL portion of the design project. In your write-up discuss your work in terms of the overall engineering design process – e.g., project justification, identification of constraints, establishment of design criteria, establishment of timetables, the partitioning of work, project monitoring, and project evaluation. Also discuss your work in terms of design iterations that occurred during the semester.

As team 9 manager, I have learned a lot about the design process from my work on the design project. As mentioned earlier, the majority of my role has been to coordinate meetings and make sure that project deadlines are being met. I also have been in charge of making sure the team is on-budget and on-time. From a project management standpoint, I have been in charge of partitioning the design work. This was done at an early stage by separating the team into a hardware group and a software group based on experience. At the very first meeting with the sponsor, I was in charge of identifying and verifying the design constraints. By creating and maintaining the project schedule and Gantt chart, I have been monitoring the project timetable and making sure we are following proper time management techniques.

Along with the project management role, I was also continuously involved with the technical portion of the project as the hardware design lead. Throughout the semester, I set up hardware meetings in order to discuss technical specifications and design issues. On the hardware side, I designed the MOSFET stator switching schematic along with the Rotor circuit and the peripheral connections to the microcontroller on the EAGLE schematic software. After designing the schematic, I organized the components on the board file and correctly routed the PCB traces and vias. After the fabrication of the board, I was involved in the component soldering and also in the connection of the software and hardware. After connecting the hardware and running tests, I was in charge of troubleshooting the hardware in order to find simple adjustments that needed to be made. I also have been suggesting new design alterations such as slight adjustments to the stator quadrature angle based on alternator performance during testing. I am also actively involved with the stator and rotor pulsing theory. The original plan was to read the angle of the rotor using the AMS sensor and pulse the stator coils every time that this was read. A more effective and efficient solution is to pulse the stator states less frequent at higher RPMs, allowing for less power consumption and wider ranges of speed. From a rotor theory standpoint, I have been involved in maximizing the field current efficiency by figuring out ways to only

apply field current to the rotor when necessary. For example, we have found it more practical to constantly magnetize the rotor at start-up for a short amount of time, and then gradually reduce the rotor field supply pulses.

3. What technical communications have I done this semester? List the reports and presentations you have helped prepare. Also indicate those presentations for which you were a speaker.

Pre-proposal document:

I was responsible for coordinating the meetings in order to work on the document and also helped to organize the layout of the document. In the document itself, I was responsible for the motivation, summary of benefits, budget, and project management sections.

Proposal document:

I was responsible for coordinating the meetings in order to work on the document and also helped to organize the layout of the document. In the document itself, I was responsible for the motivation, summary of benefits, budget, and project management sections.

Proposal presentation:

For the proposal presentation, I was responsible for scheduling meetings with our facilitator in order to review, practice, and organize the presentation. During the presentation, I introduced the team and introduced the executive summary and the high-level details of the project. I also went over the high-level project timeline and schedule.

Initial Demo:

My responsibility for the initial demo was to make sure that a working prototype was ready to be shown. I was also responsible for organizing the presentation structure, making sure that every team member had a chance to talk about the design. During the

initial demo, I presented the hardware portion which included a single phase of the stator switching circuit with LEDs simulating the switching of the stator coils.

Application Note:

Since my hardware responsibilities included the design of the schematic on EAGLE circuit software, my application note topic was titled “Getting Started in EAGLE”. I demonstrated how to begin a schematic design and how to create a footprint in EAGLE. By explaining in detail how to use the schematic tool in the software, I gained even more experience with EAGLE and schematic design.

Final Report:

In the final report, I will be responsible for making sure that meetings are scheduled to work on the report and also that it is completed on-time. I will be responsible for the introduction, project management, and hardware design sections of the final report.

Final Presentation:

In the final presentation, I will be responsible for making sure the team is adequately prepared to present on Design Day. I will also be responsible for the introduction section of the presentation as well as the agenda, project management, cost, and high-level hardware sections.

4. What is the impact of this course on my career objectives and professional goals?

This course will have an immense impact on my career objectives and my professional goals. I wanted to be a team manager this semester because I feel like my strength is as a leader on a design team. I enjoy managing cross-functional design teams, and this project has proven to be a great experience for me. In the near future, I hope to become a manager of a design team at a consumer electronics company. The leadership experience that I have gained from this project will help me to achieve my future goals of becoming a manager. I have learned to manage my time effectively, coordinate productive meetings with our team members, sponsor, and facilitator, and

delegate tasks in the most effective way possible. I have also learned the importance of active communication between team members.

From a technical and hardware standpoint, learning how alternators work and their numerous applications will also help me in the future. Before this project, I was not familiar with how electrical energy could be converted to mechanical energy using an automotive alternator. I also had no idea that alternators could be modified to act as an efficient DC-motor. I also learned about how to protect hardware from over-current and over-voltage situations. Most of the hardware design that I am familiar with is low voltage and current ratings. I am glad I have obtained experience using high voltage and current ratings.

Gaining experience using EAGLE software for schematic and PCB design will also help me achieve future goals. Before becoming a manager, I want to be a part of a hardware team using software similar to EAGLE.

5. What are my primary strengths and weaknesses?

My primary strengths are being able to lead a team effectively and being a people-oriented leader. I strive to create cohesion in group settings, and I will do whatever it takes to accomplish my goals. I also believe that I have an entrepreneurial mindset and I thrive on the opportunity to rise to a challenge.

One of my weaknesses is that I tend to be a bit perfectionistic in my approach to my work, and I tend to focus solely on one problem and spend too much time on that one problem. Another weakness is that I am very critical of my own work. I have always prided myself on making sure that my work is error-free. While this can be beneficial, it can also prove to be very time consuming. I have been making a conscious effort to trust myself and my work.

6. Where would I like to be professionally five years after graduation?

Five years after graduation, I see myself as the manager of a consumer electronics company leading a medium-sized team of engineers. I want to be able to apply both my project management skills as well as my technical skills to provide innovative solutions to complex problems. At this point in time, I plan to be ready to take the GMAT entrance exam. I plan to take this exam so that I can obtain an MBA at a large business school. I believe that having a Bachelor's Degree in Electrical Engineering and an MBA at a large university will help me become a very marketable employee. Before securing a managerial role at a consumer electronics company, I plan to work in a technical area such as validation or as a design engineer.

7. What lifelong-learning steps must I plan to undertake in order to achieve this five-year professional goal?

In order to obtain a leadership role in the near future, I will need to be willing to learn new ideas every single day. I will need to gain more experience in team settings and with project management. My previous internships at Bosch and at GM have taught me that it is also important to network and to make as many professional connections as possible. Having the ability to network and reach out to higher-level colleagues will allow me to find new experiences and challenges. I will also need to continue to gain more technical knowledge and experience. This will be done by finding a technical role early after graduation. I hope to work in a hardware or validation rotation right after graduation. After completing a technical rotation, I plan to move towards a managerial role. In order to accomplish these goals, it will be very important for me to continue to build my technical skills, project management skills, and my professional network.

Appendix

Resume attached on the next page.

TYLER J. BORYSIAK

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EDUCATION

Michigan State University, East Lansing, Michigan

Class of 2015

Projected Graduation: December 2015

College of Engineering: Electrical Engineering

Dean's List Fall 2011, Spring 2012, Fall 2012, Spring 2013, Spring 2014, Fall 2014, and Spring 2015

Trenton High School, Trenton, Michigan

Class of 2011 Valedictorian

College GPA

3.62/4.0

High School GPA

4.0/4.0

WORK EXPERIENCE

General Motors Company- Advanced Vehicle Development Electrical Engineering Intern

Summer 2015

- Evaluated the impact of the implementation of new electrical architecture in future vehicle programs, summarizing and reporting findings across multiple internal departments
- Utilized systems engineering tools such as Teamcenter VisMockup and Mentor Graphics Capital Integrator, constructing an architectural plan view consisting of all of the electrical content in a flagship program
- Coordinated with AVD Integrators and Sub-System Architects, developing early module packaging strategies
- Collaborated with Cost Engineers, Business Architects, VSEs, and Buyers, creating a standardized and accurate cost tracking file for future programs
- Completed Design for Six Sigma leader training, actively participating in a DFSS Green Belt root-cause analysis project

Robert Bosch LLC- Automotive Electronics Project Management Intern

Summer 2014

- Aided the implementation of a cross-divisional process tool, generating traceability throughout all phases of the project management cycle
- Continuous Improvement Process team leader for the development of an efficient sample process tool, resulting in internal cost savings and on-time sample delivery to the customer
- Reflashing and system testing of GM Central Gateway Modules and Body Control Modules
- Updated technical project documents, ensuring on-time kickoff of new GM projects
- Coordinated with the plant on customer volume requirements, securing adequate capacity to meet project demand
- Processed customer prototypes and updated sample orders in the SAP, Covisint, PPPS, and GPIRS tracking tools, developing a clear commitment to meet customer timing

Robert Bosch LLC- Passive Safety Systems Hardware Intern

Summer 2013

- Developed a time tracking macro to categorize departmental projects, highlighting constraints throughout the process and opportunities to reallocate resources to high priority tasks
- Tested airbag electronic control units, ensuring proper adherence to Bosch and customer requirements
- Acquired knowledge from data sheets, schematics, and technical documents, demonstrating a strong competence of Passive Safety products
- Performed voltage and current data analysis, temperature testing, and PCB circuit analysis, developing hardware solutions for Bosch Passive Safety products
- Utilized MATLAB, PSpice, and Visual Basic, performing simulations and computations to provide hardware design solutions

ADDITIONAL

- Proficient in MATLAB, HFSS, PSpice, Cadence, VHDL, Eagle, Microsoft Excel, Project, Visio, Visual Basic, Word, PowerPoint, and ongoing training with C
- Member of Michigan State Audio Enthusiasts Engineers Color Organ Team, developing and testing prototype circuit designs for various audio applications
- Participated in community service projects around Detroit, including Belle Isle restoration, volunteering at Eastern Market, and mentoring incoming Michigan State Freshmen
- Captain of Trenton High School Varsity Tennis, placing 8th in the state during the 2009 season
- Avid golfer of 18 years